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8 The EPA Superfund Programs 1, 2, and 3, 1980–1995

8.1 BACKGROUND

The Superfund Program was created by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980. The program was in response to the need to clean up the nation's worst hazardous waste sites. At that time, the extent and severity of the hazardous waste problems were felt to be limited. As discussed in [Chapter 1](#), headline stories in the 1970s had a focus on Love Canal in New York, Valley of the Drums in Kentucky, and Times Beach in Missouri, where lives were disrupted because of public health problems.

CERCLA authorized EPA to:

- Protect human health and the environment against threats posed by uncontrolled releases of hazardous substances;
- Manage a \$1.6 billion Hazardous Substance Response Trust Fund, the “Superfund”, created from a “front end” tax on crude oil and other commercial chemical feedstocks;
- Identify and prioritize responses to releases, or threats of releases, of hazardous substances that pose a potential threat to human health and/or the environment;
- Ensure that sites and releases are cleaned up to mitigate both the short-term and long-term threats;
- Require responsible parties to pay for cleanups wherever possible through enforcement provisions;
- Allocate Superfund dollars for cleanups in cases where the responsible parties could not be held accountable;
- Develop a mechanism for the federal government to recover costs of its cleanup actions from those responsible for the problems.

Section 105 of CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires the Environmental Protection

Agency (EPA) to maintain a National Priorities List (NPL) of hazardous waste sites with known or threatened releases. The NPL identifies abandoned or uncontrolled hazardous waste sites that warrant further investigation to determine if they pose a threat to human health or the environment. Only sites on the NPL are eligible for Superfund-financed remedial action under CERCLA. However, removal and enforcement actions may be taken at sites that are not on the NPL but pose a threat to human health and the environment. The EPA may delete a site from the NPL if it determines that no further response is required to protect human health and the environment.

The law authorizes the federal government to respond directly to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. Legal actions can be taken to force parties responsible for causing the contamination to clean up those sites or reimburse the Superfund for the costs of cleanup.

Superfund budgets come from excise taxes on petroleum and feedstock chemicals, a tax on certain imported chemical derivatives, an environmental tax on corporations, appropriations made by Congress from general tax revenues, and any monies recovered or collected from parties responsible for site contamination.

The Superfund Program received a \$1.6 billion budget in 1980 to clean up the nation's priority sites. However, the number of highly toxic waste sites was grossly underestimated, and the program has been reauthorized twice: in 1986 for five years and \$8.5 billion, and in 1991 for three years and \$5.1 billion. This postmortem goes through 1995.

8.2 FEDERAL LAWS GOVERNING CLEANUP OF THE ENVIRONMENT

Superfund was created by the passage of CERCLA in 1980 to complement other federal environmental laws that emphasize reducing new emissions of hazardous substances or cleaning up narrower categories of sites. Among the more relevant ones are:

1. *The Resource Conservation and Recovery Act of 1976 (RCRA)*, which amended the Solid Waste Disposal Act of 1965, and established in its Title C a national program for tracking and managing hazardous wastes and a corrective action program requiring cleanup of such wastes released into the environment at treatment, storage,

or disposal (TSD) facilities, which include many industrial plants. The corrective action program is defined more narrowly than the Superfund program, which covers a broader class of hazardous substances and is not limited to releases occurring at facilities; also, some TSD facilities are likely to end up as Superfund sites because their owners and operators are unable or unwilling to comply with the corrective action requirements. Nonetheless, the large number of TSD facilities potentially requiring cleanup may make total cleanup costs under RCRA higher than under Superfund. The initial RCRA statute did not direct the EPA to regulate underground storage tanks containing chemical products as opposed to wastes; nor did the 1980 Superfund law authorize the agency to clean up leaks of petroleum and petroleum products (which are generally excluded from the Superfund definition of hazardous substances) from such tanks. These gaps in authorization were filled in 1984 and 1986. Among the many changes made to RCRA by the Hazardous and Solid Waste Amendments of 1984 were provisions requiring EPA to set standards for the design, operation, and cleanup of underground tanks containing petroleum or hazardous products. Authorization for EPA to clean up leaks from petroleum tanks was included in the 1986 amendments to Superfund, which also created a smaller Leaking Underground Storage Tank Trust Fund to finance such cleanups. The 1984 amendment also resulted in a stronger focus on the Corrective Action Program by having the companies responsible for the hazardous wastes clean up the contamination themselves.

2. *The Clean Water Act*, formally the Federal Water Pollution Control Act Amendments of 1972, which created the federal authority to regulate cleanup of oil spills that pose a threat to surface water. The Oil Pollution Act of 1990 authorized using the existing Oil Spill Liability Trust Fund to pay for cleanup, raised existing limits on spillers' federal liability, and authorized the Coast Guard to require that owners and operators of oil-related facilities and vessels have plans for containing and removing such spills in coastal areas.
3. *The 1976 Toxic Substances Control Act (TSCA)*, which authorized EPA to regulate both the use, labeling, and disposal of new and existing chemicals used in manufacturing and commerce and the cleanup of spills of polychlorinated biphenyls (PCBs). The Asbes-

tos Hazard Emergency Response Act amended TSCA in 1986, adding requirements that EPA set standards for cleaning up asbestos in school buildings. Superfund cleanups must meet the TSCA standards where applicable or “relevant and appropriate.”

4. *The Surface Mining Control and Reclamation Act of 1977*, which established a permitting program in the Department of the Interior to require active coal mining operations to meet environmental and reclamation standards. It also placed a tax on current coal production to fund reclamation of mines abandoned before 1977 or before enactment of the regulations implementing the law. The tax money, however, cannot be used to clean up mines for which a responsible former operator could pay; in such cases, cleanup can proceed only under Superfund or state authorization. Amendments passed in 1990 also prohibit this money from being used to clean up mines listed as NPL sites, even if no solvent operators exist.
5. *The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA)*, which directed the Department of Energy to clean up sandlike tailings left from uranium-processing operations at 24 specific inactive sites. These sites are excluded from the Superfund program, as are any releases of radioactive substances from nuclear power plants. Other radioactive wastes, including uranium tailings at milling sites not included in the UMTRCA list, can be cleaned up under either Superfund or the Atomic Energy Act of 1954, as amended.
6. *Superfund Amendments and Reauthorization Act* — in October 1986, the Superfund Act was amended under the Superfund Amendments and Reauthorization Act (SARA). These amendments provide mandatory schedules for the completion of various phases of remedial response activities, establish detailed cleanup standards, and generally strengthen existing authority to effect the cleanup of superfund sites.
7. *Emergency Planning and Community Right-to-Know Act* — also known as SARA Title III, this act is intended to encourage and support emergency planning efforts at the state and local levels and to provide local residents with information concerning potential chemical hazards in their communities. Section 313 of the act requires manufacturers to report to the EPA and to the states the amounts of over 300 toxic chemicals that they release to the air, water, or land, or that they transfer to off-site facilities that treat or dispose of wastes. The law also requires the EPA to compile these

reports into an annual assessment called the Toxic Release Inventory — also available to the public in a computerized database.

In addition to the foregoing, there have been a number of Executive Orders issued by the President, ostensibly to strengthen the implementation and enforcement of the laws pertaining to the environment and public health. Unfortunately, the pollution of our environment goes on, with continued damage to public health, waterways, and wildlife.

8.3 PROCEDURES FOR NPL SITE CLEANUPS

The Superfund program has two basic types of cleanups: short-term cleanups (removal actions) and long-term cleanups (remedial actions).¹ In the Superfund removal program, actions are taken to mitigate immediate and significant threats, such as those stemming from contaminated drinking water or unrestricted access to hazardous waste sites. These actions are generally of a short-term and emergency nature, such as providing alternative drinking water supplies and cleaning up chemical spills caused by transportation accidents.

To perform a remedial action, EPA must go through the formal process of placing a site on its National Priorities List (NPL). EPA may then go through a series of steps to perform the cleanup:

Step 1: Conduct a site study to identify wastes and to evaluate and select a remedy for the contamination identified. This phase is known as the remedial investigation and feasibility study (RI/FS or site study).

Step 2: The period of time between the end of the study phase (RI/FS) and the beginning of the next phase (remedial design) can be a significant factor in the length of time expended on the cleanup process.

Step 3: Design methods for implementing EPA's chosen remedy. This phase is known as remedial design (RD).

Step 4: Construct and implement the remedy. This phase is known as remedial action (RA).

Step 5: Prepare an operations and maintenance (O&M) plan for each cleanup remedy. During O&M, the site must be continually monitored to ensure the effectiveness and integrity of the cleanup activities.

Step 6: NPL deletion indicates that all cleanup activities at a site are complete and the site is considered safe for a particular use. The site is then monitored for five years before deletion from the NPL.

Any or all of the cleanup phases may be paid for and performed by a responsible party (RP) under a legally enforceable agreement with EPA. Superfund money is used in the event the responsible party cannot be found. CERCLA does provide for recovery of the costs after the cleanup. Cleanup work at a specific site is sometimes broken into separate projects (referred to as operable units). Thus, a site may have a site study ongoing for one of its operable units and design work ongoing for another. Once EPA and the state in which the site is located have determined that all work at a site has achieved the desired cleanup goals, the site can be removed (deleted) from the NPL.

It is significant to the foregoing to note that EPA has 10 regional offices across the country, with each one semi-autonomous in managing site cleanups in its particular region. The senior author noted the wide variations in remedial actions in his meetings with EPA senior staff in both 1983 and 1993.

8.4 MONITORING SITE CLEANUPS

Concerned citizen groups began to monitor the site cleanup programs in 1983. Congress investigated allegations of political manipulation and mismanagement in 1983, resulting in the resignation of EPA's administrator and the incarceration of the Superfund top official. The General Accounting Office (GAO), the investigative arm of Congress, initiated studies and reports on waste, fraud, and mismanagement in EPA's contracts to carry out Superfund cleanups as early as 1987.² Congress itself has been critical of the Superfund Program through the Committee on Environment and Public Works (Senate) and the Office of Technology Assessment (OTA).

8.5 RESULTS AND PROBLEMS

In 1980, Superfund Program Number 1 evolved with an initial budget of some \$1.6 billion to commence the task of cleaning up the hundreds of leaking toxic waste sites across the country that pose a serious threat to public health. This budget was depleted by 1985, with only six sites reported to be cleaned up, and the number of toxic waste sites was increasing.

Superfund Program Number 2 was approved by Congress in 1986, giving EPA \$8.5 billion to clean up approximately 300 sites over a five-year period. EPA expended that budget as of the end of fiscal year 1991, reporting only

57 additional sites being cleaned up, including sites pending close out approval (a total of 63 out of a list of 1250 NPL sites).

Superfund Program Number 3 was approved in 1991 for an additional \$5.1 billion through 1994. As of September 30, 1994, another 27 sites were fully restored. Another 150 NPL sites were in various stages of cleanup, but their statuses (steps 1, 2, etc.) were not clear. Meanwhile, the NPL sites have increased to 1320. The average cost of cleaning a site is over \$30 million, according to EPA senior staffers. The average total time to completely clean a site (NPL) is eight years.

Thus, after 14 years and over \$14 billion expended, approximately 90 NPL sites have been eliminated out of an estimated 1,320, and the number of NPL sites is increasing. The \$14 billion is Superfund money, which is approximately 50 percent of the total costs involved (responsible parties' obligations). There has been criticism of the Superfund Program by the University of Tennessee Waste Management and Research Institute (1991),³ the American Society of Civil Engineers (Civil Engineering Magazine),⁴ Office of Technology Assessment (OTA — a support agency of Congress), Clean Sites,⁵ the General Accounting Office (GAO),⁶ and many others. The most extensive monitoring has been done by Clean Sites, a consortium of industry and environmental leaders committed to solving America's hazardous waste problems.*

The end result after 14 years is a fragmented program saturated with waste and mismanagement. Moreover, each day more and more communities discover that they are living near hazardous waste dumps contaminated by dioxin, vinyl chloride, PHB, PCB, lead, mercury, and arsenic. These critical sites are compounded by the thousands of sites contaminated by nuclear weapons research and production facilities from 1947 to 1992.⁷

The GAO listed the Superfund Program Management as one of 17 programs considered high-risk — especially vulnerable to waste, fraud, abuse, and mismanagement (GAO).⁶ This report was part of a high-risk series prepared for the incoming Clinton Administration in December 1992. There has been no attempt to develop a systematic program that would integrate the planning, design, and implementation of each cleanup for future planning. In addition, there has been no attempt to initiate a data base of lessons learned from each site cleaned up.

* Clean Sites was established in 1984 by a coalition of businesses, environmental groups, and administration officials. It is a nonprofit organization.

In 1989, then-new EPA Administrator William Reilly initiated a 90-Day Study of the Superfund Program. He emphasized the need to improve performance of NPL site cleanups. He also called for forcing responsible parties (PRPs)* to take responsibility for cleanups through an aggressive use of unilateral cleanup orders. This policy shift, for the first time, was a conscious, positive strategy designed to accomplish the goals of the law.

In an effort to shorten lengthy (and expensive) cleanups, EPA has introduced the Superfund Accelerated Cleanup Model (SACM). SACM works mainly in the “front end” of the Superfund process. It reduces the individual steps by allowing initial one-step screening and risk assessment, followed by actions to reduce immediate site risks. It separates out those sites that require long-term cleanup, a period of five years or longer. ASCE (March 1993)⁴ feels the implementation system, including controls, will determine how successful SACM will be.

The Superfund Revitalization Office (SRO) was established in 1991 to “encourage new and innovative approaches in the Superfund program.” The success of SRO will depend upon the ability of the EPA to improve its planning and management systems, including oversight of all contracts. Experience to date clearly shows that the EPA Superfund has a poor track record. It needs to be reorganized to make it both accountable and cost effective.

EPA's new administrator, Carol Browner, gave testimony before the Senate Subcommittee on Superfund, Recycling and Solid Waste Management in May 1993. She said she would find an answer to the question, “Are we getting full value for our money?”. Yet, EPA continues to resist innovative change to realize accountability and cost effectiveness. This is apparent in an in-depth report by GAO to Congress in September 1994.⁸ The senior author encountered the same resistance to change during an invited informal seminar on the use of the IPQMS for Superfund at EPA in Washington in June 1993.

8.5.1 USE OF CONTRACTORS

According to the GAO, EPA is relying too heavily on contractors to clean up the NPL sites.⁹ The basic problem is lack of EPA oversight, exposing the cleanups to fraud, waste, and abuse. For example, in March 1992 GAO gave testimony that CH₂M Hill, a consulting engineering firm and one of Superfund's largest contractors, included expenses in its indirect cost pool (a

* PRP, potentially responsible party.

portion of which is charged to EPA) that were not allowable under the Federal Acquisition Regulations (FAR).¹⁰ In examining selected indirect cost accounts, such as meals, lodging, and relocation expenses, GAO identified about \$2.3 million in indirect costs that the FAR does not allow. These expenses included tickets to professional sporting events, alcohol at company parties, and travel by nonemployee spouses.

This discussion has been limited to Superfund, which badly needs a data base for scientific decision making, as covered later. However, it must be emphasized that there are untold contaminated sites on many military bases, possibly 11,000 created by the Pentagon alone (*U.S. News and World Report*, December 14, 1992).¹¹ The Comptroller General of the United States covered the sites contaminated by the Departments of Defense and Energy in the GAO High-Risk Series for the incoming Clinton Administration (GAO).¹²

An update of the high-risk programs cited in 1992 was conducted by GAO in 1994. Again, EPA Superfund was cited for making little progress in reducing the risks of mismanagement and vulnerability to waste and fraud.¹³ According to GAO, EPA has not established priorities for cleaning up nonfederal sites (sites not on military bases or nuclear weaponry research and development). This finding is consistent with the senior author's recommendation in 1993 that Superfund initiate IPQMS case histories for the lessons learned. GAO further noted that EPA had recovered only a fraction of the monies that it has spent on cleanups from responsible parties.

The EPA Superfund Program is beset with many problems, especially in the areas of management and lack of scientific guidelines for actual cleanup of toxic waste sites. Because of these gaps, the program is fragmented, with no evidence of any teamwork. Thus, a large number of major problems are apparent with the Superfund scenario for completion and deletion of National Priorities List sites (NPLs). Among the most critical are:

- Lack of adequate managerial and technical skills within EPA itself, compounded by lack of teamwork. These facts are confirmed by senior EPA staffers who see both fragmentation in the Superfund Program and imbalance regarding the backgrounds of decision-making staff members. There are simply too few experienced engineers and managers (see GAO references and source materials).
- Extensive use of outside consultants (engineers) and contractors with no effective oversight by either headquarters or field personnel on work performed and budget expended. EPA itself admits that large amounts of money are being wasted. The Office of Technology Assessment (OTA) reports that 80 to 90 percent of the Super-

fund budget has gone to EPA consultants and contractors, and the program is still in a state of disarray.*

- Lack of continuity in leadership. This is a general problem in the federal government because of the nature of our political system which provides for political appointments for positions of administrators and deputy or assistant administrators in every federal agency such as EPA.
- There is uncertainty as to which cleaned-up sites are really safe and for how long.

8.6 EVALUATION

This postmortem clearly shows that the EPA Superfund program established in 1980 and reauthorized in 1986 and again in 1991 is not operating well. The program is beset with conflicts, fraud, mismanagement, and waste, despite reports by the GAO. The cleanup program has been extremely controversial since it began and the number of hazardous waste sites continues to increase at a frightening rate. Clear Sites reported in 1994 that EPA has identified almost 39,000 potentially contaminated sites, with over 1200** on the National Priorities List (NPL).¹⁴ As we discussed in Chapter 1, the number of sites contaminated as a result of nuclear weaponry research and development (1947-1992) is astronomical.

The GAO reported in 1997 that the EPA Superfund program continues to be vulnerable to waste, fraud, and mismanagement, especially in the contracting area.¹⁵ While about half of the Superfund program's budget annually goes to site cleanup contractors, EPA has had long-lasting problems in controlling contractors' charges. Lack of adequate oversight, compounded by lack of guidelines, result in a high percentage of contract costs going to administrative expenses rather than to actual cleanup work. In addition, there has been an ongoing backlog of 500 or so unfilled requests for audits.¹⁵ Similar problems prevail in the Department of Energy, which is charged with the cleanup of the old nuclear weaponry sites.¹⁵

The necessary legislation is in place to clean up the environment. Unfortunately, the cleanup program has been extremely controversial since it began, and the intensity of that controversy has grown over the years.¹⁶ In 1995, 11 years after Congress created the Corrective Action Program to clean up contamination at operating facilities, cleanup progress is limited.

* Information obtained from one of the senior author's graduate students working for GAO (March 1994).

** This number is on the low side as discussed earlier.

Although some cleanup activity is taking place under other programs, the fact remains that less than 10 percent of the facilities have completed cleanups under the Corrective Action Program, and about half of them have not even begun their cleanups under the program. While several factors influence the time it takes to complete a cleanup, two stand out:

- First, the step-by-step process for cleanup is drawn out and cumbersome, and the cost of implementing it discourages companies from initiating more cleanups.
- Second, protracted disagreements among EPA, the states, and affected companies over the cleanup standards to be met and the methods used to meet them have also delayed cleanups.

Both of these factors can contribute to the economic disincentives that companies face in performing cleanups. Furthermore, these two problems are exacerbated by the limited resources EPA and the states have for implementing the program. The cleanup program is not working the way it should. It needs to be changed. However, the necessary change can only come with teamwork among the principal parties involved.

8.7 LESSONS LEARNED

The outstanding lesson learned is the need for an overall management team trained in the IPQMS methodology to ensure cohesive teamwork of planners, designers, constructors, and managers for successful completion of all future toxic waste cleanup projects. At the same time, the policies and guidelines will be adapted to ensure successful cleanup of existing leaking toxic sites. This is consistent with the request made by W. R. Ruckelshaus in 1983.¹⁷

It is necessary to initiate a long overdue case history library of a representative cross section of toxic waste site cleanup projects, both successes and failures. These case histories should be researched, analyzed, evaluated, and published in the conceptual framework of an integrated planning and quality management system (IPQMS).

The IPQMS forcefully demonstrates the benefits to all the principal groups involved in projects in any sector when the groups work together as members of a team. EPA career staff members should be trained and organized in the IPQMS framework. They should then be trained to research and document IPQMS cases of at least six Superfund sites in the category of “completion”. The lessons and insights from these cases will demonstrate the significance of the IPQMS methodology in improving the planning,

design, and management of future projects in this crucial field. The end result will be guidelines and checklists to ensure teamwork, accountability, and cost effectiveness.

New policies and guidelines will be developed from IPQMS case histories of a representative cross section of toxic waste site cleanup projects, both successes and failures. These cases will form an overdue data base. The cases will document each site regarding nature of problems, procedures used to clean up the site, overall results including costs, and a comprehensive evaluation of each task in the cleanup.

Senior EPA career staff members must be appointed as administrators or directors of the various programs and projects to ensure the necessary continuity in leadership. They will be trained in the IPQMS methodology.

EPA officials have ignored recommendations by some of its senior staffers who have studied the benefits of the IPQMS. Indeed, one was forced into early retirement because of her “whistleblowing”.

The lessons learned from this postmortem will also be beneficial to the cleanup of the thousands of sites contaminated by the military ([Chapter 1](#)).

8.8 EPILOGUE

The EPA Superfund program has not been reauthorized by Congress since its 1991–1994 authorization. EPA has been spending about \$1.4 billion a year since early 1995 to continue the Superfund cleaning up of the nation’s worst hazardous waste sites (NPL sites).¹⁶ The total costs of cleaning up nonfederal hazardous waste sites (mainly industrial) is far greater than EPA or Congress estimates. There are over 1300 NPL sites with another 21,000 or more to assess. Cost estimates range from \$16 billion (EPA) to \$151 billion (University of Tennessee).³ These are federal costs only, with responsible parties costs equal or greater.

Meanwhile, the Department of Defense (DOD) faces a massive cleanup problem extending to some 27,700 potentially contaminated sites located on over 9,700 military installations and former defense properties in all 50 states. The DOD estimated in late 1994 that the program could cost about \$30 billion.¹⁸ Experience with Superfund estimates and actual costs from 1980 to 1995 is such that this figure will be much larger, possibly \$60 billion.

Chapter 1 briefly discussed the contamination from over 50 years of secret research and development of nuclear weapons. The nuclear complex of the Department of Energy (DOE) consists of 16 major facilities or instal-

lations spread over 13 states. Today that complex holds in storage over 100 million gallons of highly radioactive waste, 66 million gallons of waste contaminated with plutonium, and even larger volumes of waste with lower levels of radioactivity. In addition, radioactive and other hazardous substances have contaminated soil and groundwater at DOE's installations. Although some of DOE's environmental problems involve conventional contaminants that are common to many cleanup tasks, the vast majority of its pollutants contain some level of radioactivity and so pose challenges unique to DOE.

In 1989, DOE created the Office of Environmental Restoration and Waste Management (EM), which has primary responsibility for cleanup activities. Since its inception, the office has experienced rapid budget increases. Its budget has risen from \$1.6 billion in 1989 to more than \$6 billion in 1995, representing over \$29.0 billion in seven years. Funding devoted to the cleanup program is projected to continue to increase, rising to more than \$7 billion annually by 2000.

How much the cleanup program will ultimately cost taxpayers is unknown. In 1988, DOE estimated that the cost would be between \$66 billion and \$110 billion, but estimates keep rising. In 1993, DOE officials suggested the cost could range from \$400 billion to \$1 trillion.¹⁹ But no one can make an estimate with any degree of confidence until the Congress and regulators clarify the ultimate goals of the program, which include reducing health and safety risks to humans and mitigating damage to the environment. The goals may also include restoring sites to make them available for other uses — industrial, commercial, residential, or recreational.

Six of DOE's 16 major facilities — Hanford, Savannah River, Oak Ridge, Fernald, Idaho National Engineering Laboratory, and Rocky Flats — account for more than 60 percent of the budget of DOE's environmental cleanup program. Hanford alone is responsible for nearly a quarter of the budget. Hanford, in Richland, Washington, was the premier bomb factory in the country, and also the most contaminated. The Hanford Nuclear Reservation occupies 560 square miles. It includes 177 underground storage tanks which were constructed between 1943 and 1986. The tanks contain over 61 million gallons of high-level radioactive waste, with a history of poor maintenance of the gauges that detect leaks.²⁰ Also, many of the initial tanks are single shell (149 in all), with over half leaking radioactive wastes into the ground and the groundwater that flows into the Columbia River.

A more detailed summary of the background, problems, and lessons learned from Hanford is presented in [Chapter 9](#).

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